

REMARKS

This is in response to the Official Action of December 8, 2003.

Entry of this Amendment and allowance is respectfully requested.

Applicant is providing a marked copy of Figure 1, showing the labeling that has been required by the Examiner in a proposed manner in red ink. The components are identified in the specification, and the components are too small to place the wording directly in the box representing the component. The wording is put adjacent to the component on the drawing. The current generator and voltage monitor each are combined with the element 11 and the respective amplifiers 15 and 19, so the wording is placed between those two components.

Approval of the drawings changes is requested prior to presenting a formal drawing.

The objection to the abstract is overcome by the amended abstract submitted herewith on a separate page.

The Examiner rejected claims 1, 2, 8 and 10 as being anticipated by the Turner patent 4,338,097. Turner was combined with the Marsh patent 2,987,672 for rejecting claims 3-6. Claim 7 was indicated as being allowable.

Claim 9 was rejected on the combination of the Turner patent and Rhodes patent 4,587,479.

Claim 1, the only independent claim, has now been amended to overcome the anticipation rejection and to define patentable subject matter over the Turner et al. patent. In particular, claim 1 has been amended to clearly claim a closed ring forming the sensor element, and with the further definitions of the closed rings, including a resistance monitor monitoring changes in electrical resistance in the ring sensor element.

The closed ring is not suggested or disclosed in the Turner et al. patent. The closed ring is clearly shown in the

present drawings, and is further described on page 8 of the present specification. Neither the Turner et al. nor the Marsh or Rhodes patents describe or in any way describe or teach a sensor element formed as a closed ring. Since they do not suggest it nor teach the claimed arrangement, these patents do not render the claim obvious.

Specifically, in column 4, lines 1-9 of the Turner patent 4,338,097, the test element is stated to extend "almost" completely around the interior wall of the pipe, or it is disclosed as being made as a helix with "overlapping ends".

The test element in Turner is therefore not a closed ring. A helix has spaced sections that overlap each other, and if an element extends "almost" completely around the interior wall of the pipe, it is not a closed ring.

Numerous advantages are provided by forming a sensor element as a closed ring of material. The sensor element can be easily manufactured by slicing a pipe of the desired material to form that closed ring. The sensor also may be cut from a sample of the pipeline material itself, and the structure of the sensor element would then be as near to identical as possible as the structure of the pipeline being tested. These advantages are described in more detail on pages 8 and 9 of the present specification.

It is clear that the width of the element can be selected easily in this way of forming, the process of forming the rings is quite clearly easily carried out.

Therefore, since Turner and the other references do not disclose the closed ring construction, it is respectfully submitted that Turner et al. does not anticipate or render obvious claim 1, or its dependent claims, and that the respective secondary reference to Marsh and Rhodes do not in any way suggest, teach, or render obvious the closed ring.

Favorable action is therefore respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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ELECTRICAL RESISTANCE SENSOR AND APPARATUS FOR MONITORING CORROSION

ABSTRACT OF THE DISCLOSURE

5 An apparatus (1) is disclosed for monitoring the effect on
a material of exposure to a fluid, and thereby monitoring the
effect on a section of pipe (9) for carrying the fluid. The
apparatus ~~comprises~~ includes a sensor element (51) exposed to
the fluid and formed as a ring of the material coaxially mounted
10 within, but electrically insulated from, the section of pipe
(9). Changes in the electrical resistance of the sensor element
(51) are monitored. Preferably, the apparatus also ~~comprises~~
includes a reference element (31) electrically insulated from
the pipe (9), electrically connected in series to the sensor
15 element (51) and protected from exposure to the fluid. The
elements may both be made from the same material as the pipe (9)
and, as they are contained within it, experience the same
temperature and pressure variations as the pipe (9). In this
manner a change in the resistance of the sensor element (51)
20 caused by corrosion/erosion by the fluid accurately indicates
the degree of corrosion/erosion of the pipe (9) carrying the
fluid.